

CLAIMS

What is claimed is:

1. Apparatus comprising a perfusion fluid loop for maintaining an *ex vivo* organ in viable condition for transplantation, said perfusion fluid loop comprising:
an organ container for receiving an organ to be transported,
a bubble remover for removing gas bubbles from perfusion fluid disposed in said perfusion fluid loop, and
an oxygenator for supplying oxygen to and removing carbon dioxide from perfusion fluid disposed in said perfusion fluid loop,
in which at least one of said organ container, said bubble remover, and said oxygenator is disposable after a single use.
2. The apparatus of claim 1, in which said perfusion loop further comprises a flexible tube, said flexible tube is an unbroken length of tubing connected at one end to one of said organ container, bubble remover, and oxygenator, and at the other end to another of said organ container, bubble remover, and oxygenator, and said pump comprises a peristaltic impeller for driving fluid flow in said flexible tube.
3. The apparatus of claim 1, further comprising a temperature regulator in heat exchange relation to said perfusion fluid loop.
4. The apparatus of claim 3, in which said temperature regulator is a cooler comprising a vessel for containing a coolant and a heat exchange tube, said tube having inlet and outlet ends adapted for connection into said perfusion fluid loop and a bight portion disposed within said vessel for contacting a coolant in said vessel.
5. The apparatus of claim 3 in which said temperature regulator is a Peltier-effect thermoelectric heat pump.

6. The apparatus of claim 5, in which said heat pump is adapted to selectively heat or cool said perfusion fluid.

7. The apparatus of claim 5, further comprising a temperature control for controlling the temperature of a perfusion fluid in said perfusion fluid loop.

8. The apparatus of claim 7, in which said temperature control is programmed to cool perfusion fluid in said perfusion fluid loop following a specified temperature-time profile.

9. The apparatus of claim 8, in which said temperature control is further programmed to heat perfusion fluid in said perfusion fluid loop following a specified temperature-time profile, after cooling perfusion fluid in said perfusion fluid loop following a specified temperature-time profile.

10. The apparatus of claim 3, in which said organ container has a heat exchange surface and said temperature regulator is in heat-exchange contact with said heat exchange surface.

11. The apparatus of claim 3, wherein said perfusion fluid loop further comprises a reservoir.

12. The apparatus of claim 11, wherein said temperature regulator is disposed within said reservoir.

13. The apparatus of claim 1, further comprising a processor programmed for processing data associated with said apparatus.

14. The apparatus of claim 13, further comprising an input device for communicating to said processor the size and type of organ being transported in said apparatus.

15. The apparatus of claim 13 in which said processor is programmed to adapt a parameter to suit the type and size of organ entered at said input device.

16. The apparatus of claim 15, in which said parameter is oxygen partial pressure or oxygen flow rate.

17. The apparatus of claim 1, in which said perfusion fluid loop comprises a headspace positioned for collecting a gas from perfusion fluid and a venting valve communicating with said headspace, through which a gas may be vented to the atmosphere, said apparatus further comprising a processor, said venting valve being controlled at least in part by control signals from said processor.

18. The apparatus of claim 17, further comprising a gas sensor for detecting the presence of gas in said headspace requiring purging, said processor being programmed to open said venting valve to vent gas when said gas sensor detects the presence of gas in said headspace requiring purging.

19. The apparatus of claim 18, further comprising a gas sensor for detecting the absence of gas in said headspace requiring purging, said processor being programmed to close said venting valve when said gas sensor detects the absence of gas in said headspace requiring purging.

20. The apparatus of claim 18, further comprising a pressure sensor for detecting pressure within the perfusion fluid loop and transmitting data reflecting the pressure to said processor.

21. The apparatus of claim 1, in which said organ container, said bubble remover, and said oxygenator are disposable after a single use.

22. The apparatus of claim 21, further comprising a flexible tube that is disposable after a single use joining at least two of said organ container, said bubble remover, and said oxygenator.

23. The apparatus of claim 22, further comprising a reusable impeller engageable with said flexible tube for propelling perfusion fluid through said flexible tube.

24. The apparatus of claim 21, comprising a portion that is disposable after a single use and normally exposed to a perfusion fluid in said perfusion fluid loop when said apparatus is in use, and a reusable portion not normally exposed to a perfusion fluid in said perfusion fluid loop.

25. The apparatus of claim 1, in which said organ container is disposable after a single use.

26. The apparatus of claim 1, further comprising a radio frequency identification tag installed in fixed relation to said organ container and configured to communicate at least one datum respecting at least one of said organ container and its contents.

27. The apparatus of claim 26, further comprising a radio frequency identification tag reader for detecting data transmitted by said radio frequency identification tag.

28. The apparatus of claim 27, further comprising a processor programmed for receiving data from said reader and controlling said apparatus responsive to the data.

29. The apparatus of claim 28, in which said data represents a parameter selected from at least one of perfusion fluid pressure, perfusion fluid flow rate, perfusion fluid temperature, perfusion fluid temperature-time profile, perfusion fluid oxygen pressure, perfusion fluid carbon dioxide pressure, perfusion fluid nutrient level, perfusion fluid metabolite level, or the maximum remaining transport time allowed for said organ.

30. The apparatus of claim 1, in which said organ container comprises a cover having an inside portion and an outside portion, said apparatus further comprising an adapter having a first portion defining a perfusion fluid inlet, a second portion adapted for connection to a vessel of an organ in said organ container for directing perfusion fluid into the vessel, and a quick connect-disconnect coupling for connecting said adapter to the inside portion of said cover.

31. The apparatus of claim 1, in which said bubble remover is disposable after a single use.

32. The apparatus of claim 1, in which said oxygenator is disposable after a single use.